

WHAT IS CLAIMED IS:

1. A miniature X-ray device for an X-ray catheter comprising:  
an insulating shell having an interior space at a substantially vacuum environment;  
an anode disposed within said insulating shell;  
a cathode disposed within said insulating shell, opposite said anode, said cathode having a focusing cup formed therein; and  
an emitter material disposed on said focusing cup.
2. The X-ray device of claim 1, wherein said emitter material is a diamond product.
3. The X-ray device of claim 2, wherein said emitter material is deposited by laser deposition.
4. The X-ray device of claim 1, wherein said focusing cup comprises a metal coating on a surface of said focusing cup.
5. The X-ray device of claim 4, wherein said emitter material is a diamond product.
6. The X-ray device of claim 4, wherein said metal coating is a high work function metal.
7. The X-ray device of claim 1, wherein a vertex of said focusing cup is located in a region where the resulting electric field is 3 to 5 times lower than the electric field at an edge of said focusing cup.

8. The X-ray device of claim 1, wherein an end of said anode is a flat surface.

9. A miniature X-ray device for an X-ray catheter comprising:  
an insulating shell having an interior space at a substantially vacuum environment;  
an anode disposed within said insulating shell;  
a cathode disposed within said insulating shell, opposite said anode; and  
a coating having a negative secondary emission yield disposed on a surface of said insulating shell.

10. The X-ray device of claim 9, wherein said coating is applied to an interior surface of said insulating shell.

11. The X-ray device of claim 10, wherein said coating is applied in a circumferential band in the region of a gap between said cathode and said anode.

12. The X-ray device of claim 11, wherein said coating is selected from the group of chromium oxide and titanium.

13. The X-ray device of claim 9, further comprising:  
a focusing cup formed in said cathode; and  
an emitter material disposed on said focusing cup.

14. The X-ray device of claim 13, wherein said emitter material is a diamond product.

15. The X-ray device of claim 14, wherein said emitter material is deposited by laser deposition.

16. The X-ray device of claim 9, wherein said coating is 0.1-2.0 microns thick.

17. A miniature X-ray device for an X-ray catheter comprising:  
an insulating shell having an interior space at a substantially vacuum environment;  
an anode disposed within said insulating shell;  
a cathode disposed within said insulating shell, opposite said anode, said cathode having a focusing cup formed therein, said cup including a non-emitting metal liner;  
an emitter material disposed directly on a surface of said focusing cup; and  
a coating having a negative secondary emission yield disposed on a surface of said insulating shell.

18. The X-ray device of claim 17, wherein said emitter material is a diamond material.

19. The X-ray device of claim 18, wherein said emitter material is deposited by laser deposition.

20. The X-ray device of claim 16, wherein a tip of said anode is flat.